REMARKS

Attorney for Applicant has carefully reviewed the outstanding Office Action on the above-identified application. Applicant has amended the application, as set forth herein, and submit that the application, as amended, is in condition for allowance.

Applicant has amended independent Claims 1, 17, and 48 to overcome the rejections raised in the Office Action and to further define Applicant's claimed invention. Specifically, Claims 1 and 17 were amended to change the word "identifying" to "**indicating the presence of....**" Claim 48 was amended to recite "a signal processor having a decision function for **calculating a midpoint wavelength of a reflectance spectrum** based upon the at least three reflectance levels *Ra, Rb,* and *Rc* **and determining the presence of ice or water using the midpoint wavelength.**" Applicant has also amended dependent Claims 52-54 to provide antecedent basis with amended independent Claim 48.

The Office Action rejects Claims 1-47 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. While the Office Action acknowledges that these claims "appear useful and concrete," the Office Action contends that "there does not appear to be a tangible result claimed." Specifically, the Office Action contends that "[m]erely calculating a midpoint [wavelength] and comparing the midpoint [wavelength] would not appear to be sufficient to constitute a tangible result, since the outcome of the calculating and comparing step has not been used in a disclosed practical application nor made available in such a manner that its usefulness in a disclosed practical application can be realized." (Office Action, Page 2).

Applicant respectfully traverses the foregoing rejection, and submits that amended independent Claims 1 and 17 and independent Claim 33, and their associated dependent claims, comply with the requirements of 35 U.S.C. § 101. First, as acknowledged in the Office Action, Claims 1-47 recite a useful and concrete result. Second, Claims 1-47 recite a tangible result, namely **indicating the presence of ice or liquid water on a surface** based upon the calculated midpoint wavelength and a comparison of same to a decision threshold wavelength. To determine whether a claim recites a tangible result, the USPTO Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility suggest that a claim "must set forth a practical application ... to produce a real-world result." (Interim Guidelines, Page 21). Clearly, an indication of the presence of ice or liquid water on a surface is a real-world result produced by a practical application of the recited midpoint wavelength calculation and comparison steps. For example, an indication of ice or liquid water on a surface can greatly assist aircraft personnel in determining whether it is safe to fly an aircraft. As such, Applicant respectfully submits that Claims 1-47 satisfy the requirements of 35 U.S.C. § 101.

Applicant's claimed invention relates to a method and apparatus for detecting ice and liquid water on surfaces. The presence of water or ice on a surface is determined by measuring a reflectance spectrum from a surface to be tested using a near-infrared optical imaging system, calculating a **midpoint wavelength** of a transition step of the measured reflectance spectrum, and comparing the midpoint wavelength to a decision threshold wavelength (or predetermined ranges of wavelengths) to indicate the presence of ice or water on a surface. Three reflectance levels can be measured, and a decision function can be applied to the measured reflectance levels to calculate the midpoint wavelength.

Gregoris disclose an electro-optic ice detection system for determining the presence of ice on an aircraft wing. The intensity of light in a band between 1.16 to 1.20 microns is determined, as well as the intensity of light in a band between 1.24 and 1.28 microns. A contrast (ratio) is determined by calculating the difference between the intensities over a sum of the intensities. If the contrast is positive, an indication of ice on the wing is generated. If the contrast is negative, the absence of ice is indicated.

Gregoris fails whatsoever to disclose **calculating a midpoint wavelength of a transition** in a reflectance spectrum and **comparing the midpoint wavelength to a decision threshold wavelength** to determine the presence of ice or water on a surface, as set forth in independent Claim 1 and Claims 2-16 depending therefrom and independent Claim 17 and Claims 18-32 depending therefrom. The Office Action fails to address this argument, which was previously raised by Applicant.

The Office Action points to FIG. 1 and col. 5, lines 44-65 of Gregoris as disclosing the aforementioned features. However, a careful read of both FIG. 1 and col. 5, lines 44-65 reveals no such features. FIG. 1 of Gregoris merely discloses the effective spectral reflectivities of ice and water. Absolutely no disclosure is provided of calculating a midpoint wavelength of a transition in a reflectance spectrum, much less comparing the results of such a calculation to a decision threshold wavelength. Col. 5, lines 44-65 of Gregoris, as well as the remainder of Gregoris, is equally devoid of any such disclosure. Col. 5, lines 44-65 merely describes a process for comparing light intensities in two bands for the purpose of *calibrating* the device prior to detecting ice on a surface, so as to correct for non-ideal illumination conditions. No

mention is made of calculating a midpoint wavelength of a transition threshold in a reflectance spectrum, much less comparing the midpoint to a decision threshold wavelength to determine the presence or absence of ice or water on a surface.

Put simply, the system of Gregoris measures contrast using two reflectance levels to determine the presence of ice on a surface, while Applicant's claimed invention calculates the midpoint wavelength of a transition in a reflectance spectrum and compares same to a decision threshold wavelength (or, predetermined ranges of wavelengths) to determine the presence or absence of ice or water on a surface. The system of Gregoris therefore represents an entirely different detection approach which does not antitcipate each element of Applicant's claimed invention. As such, Applicant submits that Claims 1-16 and 17-32 are patentable over Gregoris.

For similar reasons, Applicant submits that independent Claim 33 and Claims 34-47 depending therefrom, which recite the step of **calculating a midpoint wavelength of a transition using three reflectance levels**, are also patentable over Gregoris. Again, Gregoris is absent any disclosure relating to calculating a midpoint wavelength of a transition, much less less indicating the presence of ice or water on a surface if the calculated midpoint wavelength falls within pre-determined ranges. As such, Claims 33-47 are patentable over Gregoris.

Similarly, Applicant submits that amended independent Claim 48 and Claims 49-56 depending therefrom are patentable over Gregoris. Independent Claim 48, as amended, recites a signal processor having a decision function for **calculating a midpoint wavelength of a reflectance spectrum ... and determining the presence of ice or water using the midpoint**

wavelength. Gregoris is entirely devoid of these features. Nowhere does Gregoris disclose calculating midpoint wavelength of a reflectance spectrum or determining the presence of ice or water using the midpoint wavelength. Accordingly, Claims 48-56 are patentable over Gregoris.

It should be noted that the system of Gregoris operates using wavelengths of light less than 1.3 microns (i.e., wavelengths of 1.16 to 1.20 microns and 1.24 to 1.28 microns). However, the present invention operates using wavelengths of light greater than or equal to 1.3 microns (i.e., approximately 1.3 microns, 1.4 microns, and 1.5 microns). Such features are recited in dependent Claims 3-9, 13-14, 20-25, 29-30, 35-39, and 43-46, and are clearly not disclosed by Gregoris.

Applicant also notes that Gregoris fails to disclose the decision function implemented by the present invention, as set forth in dependent Claims 11, 27, 42, and 55. The Office Action contends that Applicant's claimed decision function is disclosed in col. 3, lines 27-32 of Gregoris. However, the function disclosed in the cited excerpt of Gregoris only allows for the calculation of a contrast level *C*. It is entirely incapable of being utilized to calculate a midpoint wavelength of a transition threshold of a reflectance spectrum, as in the present invention. Moreover, the contrast function of Gregoris only utilizes two input parameters (i.e., upper and lower band intensity levels R_U and R_L, respectively), while Applicant's claimed decision function utilizes three input parameters (namely, three intensity levels at reflectance levels *Ra*, *Rb*, and *Rc*). As such, the decision function of Gregoris and Applicant's claimed decision function are mathematically distinct. Accordingly, dependent Claims 11, 27, 42, and 55 are patentable over Gregoris.

All issues raised in the Office Action are believed to have been addressed. Claims 1, 17, 48 and 52-54 were amended. Claim 1-56 are pending and are in condition for allowance. No new matter is believed to have been added. Re-examination is requested and favorable action solicited.

Respectfully submitted,

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